

Zero Retries issue 0146 2024-04-05

Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1500+(!!!) ~~1400+~~ subscribers.

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Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0146>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Zero Retries Hits 1500 Subscribers!

Honestly, folks... when I began publishing Zero Retries in July 2021, I had no idea that *my quirky little newsletter* about a niche, of a niche, of a niche [1](#) would become *this* popular.

For the benefit of newer subscribers, Zero Retries was begun solely out of frustration that despite *so much technological innovation occurring in Amateur Radio*, there was no one place to know about it / read about it. Such stories were only mentioned very occasionally in the “mainstream” Amateur Radio

media. Eventually that frustration boiled over into publishing Zero Retries. At that time, I could imagine that Zero Retries might, conceivably achieve 500 subscribers - that would have been fantastic. 1000 subscribers was “oh... my...”.

And, now, *1500 subscribers?!?! Really*, I had not imagined that milestone. In addition to email subscribers, I also have a small following on Substack (via the Substack app) and readers from my notifications of new issues of Zero Retries on Mastodon (@n8gnj@mastodon.radio) and Bluesky (@n8gnj.bsky.social).

This latest surge in subscribers was, in large part, to a very nice mention by Mark Herbert GILRO - see the first story in this issue. Thanks GILRO!

My sincere thanks to all the Founding Members and Paid Subscribers who are helping keep Zero Retries going by offsetting some of the expenses incurred with Zero Retries. I plan to publish mention of all financial contributors annually on the (July) anniversary issue.

Major Conference Countdowns

- [Hamvention 2024](#) in Xenia, Ohio, USA on 2024-05-17 thru 19, in *06 weeks!*
- [HAM RADIO 2024](#) in Friedrichshafen, Germany on 2024-06-28 thru 30, in *09 weeks!*
- [JARL Ham Fair 2024](#) in Tokyo, Japan on 2024-08-24 and 25, in *20 weeks!*

See other events at the Zero Retries Guide to Zero Retries Interesting Conferences.

Sometimes Zero Retries Practically Writes Itself

This is one of those rare weeks that at the beginning of the week, I already know the major themes of the upcoming issue of Zero Retries. Significant developments happened throughout the weekend immediately following Zero Retries 0145, and the challenge is in capturing it all to report out here in Zero Retries.

For this issue... Zero Retries probably wrote itself *too much*. I have no idea what Substack is going to do with an issue this large. Substack's new “statistics state this issue is 9703 words, 481 sentences, and “reading time - About 45 minutes”. I previously worried about that problem and once published a long issue of Zero Retries in three simultaneous parts, but that ultimately proved to be a bit too painful to manage. So, I'm going to just let fly with this way-too-big-for-an-email-newsletter Zero Retries 0146... and we'll see how it goes.

DLARC Box 24 - Away!

This past week I packed up and shipped my *24th box of paper media* relating to Amateur Radio and Communications to be digitized and made available in Internet Archive's [Digital Library of Amateur Radio & Communications \(DLARC\)](#). I'm very proud to participate in DLARC and contribute unique material into DLARC that's never been available online and publicly accessible. Box 24 included:

- Issues of the *original* Zero Retries, the newsletter of the Northwest Amateur Packet Radio Association (NAPRA),
- Orbit Magazine issues 1 - 18 (except, somehow, Issue 10),
- Various Amateur Radio books² I purchased inexpensively at a recent electronics flea market,
- Manuals and sales material about a major manufacturer's packet radio products from the 1980s.

Seriously folks... look around your shack at the paper (and electronic) media that you've accumulated and imagine its value to future (and *present*) generations of Amateur Radio Operators... and its *likely demise at the recycler's* if you don't make provisions for it *now, while you can*. If you're so inclined to contribute to DLARC, contact:

Kay Savetz K6KJN
Program Manager, Special Collections
Internet Archive, Digital Library of Amateur Radio & Communications
kay@archive.org

And, kudos to ARDC for having the vision to [fund a large grant](#) ³ to Internet Archive to create DLARC... and *gratitude to K6KJN* for stepping up to manage DLARC (it's a *lot* of work).

Excitement About Amateur Radio Technological Innovation

I mean no disrespect to anyone for their opinions... but from my perspective (albeit being occasionally privy to some exciting, but private info)...

If you aren't excited about the potential of Amateur Radio in the next few years... you're *just not looking* at the same end of the “telescope” that I'm looking at.

In 2024 and beyond, Amateur Radio has *better tools, more opportunities, and more talent and collaboration* coming into it than ever before. If all you're seeing in Amateur Radio is the same old, same old... and “inevitable decline”, you're simply not looking in the right places. There's so much going on in Amateur Radio and adjacent to Amateur Radio that I can't keep up at times to report out all of what's going on in technological innovation in Amateur Radio.

I'm a bit silo'd off in this corner of the world, writing Zero Retries and working on various projects in N8GNJ Labs. To keep up my personal enthusiasm for Amateur Radio, it's become apparent that I gotta get out more and mingle with the co-conspirators of technological innovation in Amateur Radio. Home Power magazine used a great phrase to describe such folks - *Them That's Doing*.

Part of that is to *go where such folks gather*, and yes, that's on me to get myself there. Though I'm unable to attend Hamvention 2024, I'll be attending [SEA-PAC](#) (Seaside, Oregon, USA) in June and [Pacificon](#) (San Ramon, California, USA) in October. I also hope to "go North" a bit and perhaps mingle with some of the folks at various Vancouver, British Columbia Amateur Radio Clubs (especially [Surrey Amateur Radio](#), which is the parent organization of the amazing newsletterzine [The Communicator](#)).

But another part of having more interactions with co-conspirators in technological innovation in Amateur Radio is to *create* online opportunities *specific* to Zero Retries Interesting subject matter. To that end, within the next few months I'm going to start a series of Zero Retries videoconference meetings *specifically* to discuss Zero Retries Interesting topics. For example, I'm a big fan of [Radio Amateur Training Planning and Activities Committee \(RATPAC\)](#) - they do a great job, and some of their presentations are quite Zero Retries Interesting.

One unique aspect of the Zero Retries videoconferences will be that with Zero Retries, I can follow up presentations with written material, beyond what RATPAC (or most other Amateur Radio videos) do with posting videos and slide decks. With 1500 potential attendees from the Zero Retries subscriber list, that would be a bit overwhelming, so I'm going to have to figure out a way to keep it manageable - To Be Determined.

In The Meantime...

- There are a few mostly sunny days in the weather oracle's (app) forecast for this coming week that I'm looking forward to.
- I'm still contemplating next steps about the bent antenna pole. Fixing it will require ladder work that I'm not looking forward to.
- The Color Computer ephemeris still awaits boxing up.
- I'll be working on an outline for my talk later this month at [LinuxFest Northwest 2024](#) here in Bellingham, Washington on the subject of Amateur Radio and Linux. The actual presentation will be about Amateur Radio and the Open Source ethos, not just Linux.
- I'm overdue on a long-deferred project to put a radio on the air with VARA FM; my thanks to a long-waiting co-conspirator for this here in Whatcom County who is ready to test with me. Then, build up a VARA FM demonstration system with two 222 MHz radios, two modems, and two laptops for a planned demonstration later this month.
- I'll be spending significant butt-in-chair time spent on my upcoming book The Zero Retries Guide to Amateur Radio in the 21st Century.
- Zero Retries 0147 is already starting to write itself with a Zero Retries Interesting article contributed and an interesting development already influencing the theme of that issue.

73,

Steve N8GNJ

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Amateur Radio Data Appliance: URC & U-Pi-S

By Steve Stroh N8GNJ and Mark Herbert G1LRO

*In **Zero Retries 0136** - Reimagining Amateur Radio Part 2 - Data Appliance, I wrote a description of what I thought Amateur Radio needed to participate on Amateur Radio data modes was an integrated, clean system that could be stuck in a corner (no need for a "shack" or even a desk) and you accessed it and conducted your Amateur Radio (data) activities via a laptop or tablet or phone from the comfort of your couch or favorite chair. To my delight, Mark Herbert G1LRO read my concept of an Amateur Radio Data Appliance...and then created one!*



Image courtesy of Mark Herbert G1LRO

G1LRO teased this same photograph on Facebook on 2024-03-05, but didn't provide any details, thus I refrained from speculating, and didn't mention it at that time.

Over the weekend of 2024-03-30 and 31 (somewhere... I can't find the mention now), G1LRO teased about "the big announcement tomorrow". Being a fan of G1LRO and his continually expanding the capabilities of the URC, I made a point of checking out G1LRO's website first thing Monday morning, and wow...

Here G1LRO's blog post, verbatim:

[Amateur Radio Data Appliance: URC & U-Pi-S:](#)

Currently under development on the G1LRO workbench is the U-Pi-S. This unit is a companion to the Universal Radio Controller (URC) that provides key elements to create the full specification of the Amateur Radio Data Appliance.

In this article by Steve Stroh N8GNJ, Steve sets out the functionality required to create the Amateur Radio Data Appliance, being:

- Power supply
- Battery backup
- Radio transceiver
- Modem
- Embedded computer with a minimal display for status / health / troubleshooting
- Networking required to for remote access via "household" network (not Internet)
- Most of all, cabling to interconnect all of the above

The U-Pi-S is new to the line-up as it contains the power and computing facilities to create a full anonymous Amateur Radio Data Appliance.

Inside the U-Pi-S is a 12V 15W UPS with 5V power management to operate the integrated Raspberry Pi Zero-W processor. The new Pi-Zero provides ample horsepower to drive most current Ham software, and also has a small LCD screen with control buttons to display and manage system information.

On the rear panel is a high-power 5V output (1.5A) via USB to power the transceiver module, and a separate data USB connection from the Raspberry Pi to connect to the URC main functions. Additionally a 12V UPS-protected output is present to drive low-power equipment.

U-Pi-S Amateur Radio Data Appliance



Inside the U-Pi-S are the main power and computing components to support a stand-alone digital micro-station

Using the upcoming [URC transceiver module](#), a complete stand alone system can be made for uses such as APRs digipeater, simplex repeater, packet node, Allstar Node etc.

The unit runs the [DigiPi](#) software Ham Radio software suite especially well, and you'll find [specific articles](#) are making DigiPi run on the URC on this site. Of course you can run virtually any ham radio software written for the Raspberry Pi on the U-Pi-S and URC, DigiPi is just one example.

In Steve's article he proposes: "With the Data Appliance I'm imagining, add an antenna that's appropriate for the individual user's situation, and the new Amateur Radio Operator can operate Amateur Radio data modes within their apartment, condo, or home with a minimum of hassle. Sit down at the kitchen table, or the couch, with their laptop, tablet, or phone when it's convenient. The Data Appliance is tucked out of the way in a corner, perhaps even on an apartment or condo balcony with a small solar panel and antenna."

The mission for this unit is to have the URC with Transceiver and UPS providing some foundation for how Amateur Radio could be re imagined / re conceptualized to be more relevant to younger techies in the 2020s.

Please subscribe to the Zero Retries newsletter for valuable updates on the world of digital amateur radio <https://www.zeroretries.org>.

To be clear,

- All credit for this newest unit goes to G1LRO - it's *entirely* his creation. I had no idea this unit existed (I didn't collaborate on this project) until his unveiling of it on 2024-04-01.
- This is not an April Fool's Day prank (G1LRO was asked that on a Facebook comment, and he said No, it's real).

G1LRO had a bit of a head start on the Data Appliance concept as I explained in the original article when I mentioned the Universal Radio Controller V2 as a partial implementation of the Data Appliance concept:

But, with the addition of the (in development) [VHF/UHF Transceiver Personality Board](#)...

... the URC V2 takes a giant leap towards becoming a Data Appliance, albeit at 2 watts transmit power. There is some assembly required by the user (as I read the article) that requires the user to install either a VHF or UHF radio module, and some other components. Commendably, the URC V2 information is available as open source.

It was a *masterstroke* of G1LRO to incorporate a DigiPi (also mentioned in my original article) as part of his implementation of a Data Appliance.

G1LRO's URC transceiver module (previously referred to as the VHF/UHF Transceiver Personality Board) is apparently still in development, so all of the elements of a URC Data Appliance aren't quite ready for sale, but with this development, it appears imminent!

I'm grateful to G1LRO for giving form to my concept of an Amateur Radio Data Appliance. I can't wait to get one in N8GNJ Labs and put it on the air.

YouTube Overview of Universal Radio Controller

Also on 2024-04-01 (coincidentally, *I think*), Matthew Miller M0DQW published an overview of the Universal Radio Controller (but not the UPS & Compute Module unveiled today) on his Tech Minds YouTube channel.

Leave a comment

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Connect Systems Unveils Planned Radios With M17 as a Standard Feature

By Steve Stroh N8GNJ

Portions excerpted from Connect Systems, Inc. website and email are reproduced here in Zero Retries with permission of Jerry Wanger KK6LFS of Connect Systems, Inc.

Disclaimer - I have no pecuniary interest in Connect Systems, Inc. or these new radios. My sole interest is that these new radios are Zero Retries Interesting, and thus I'm sharing information about them here in Zero Retries.

*This is an exciting development in the evolution of the M17 Project. To be clear, these new Connect Systems units are not the first **radios** that implement M17. The [M17 OpenHT](#) (portable, still in development) implements M17, and OpenRTX has [developed modifications for several radios](#) to implement M17.*

The "claim to fame" of these units from Connect Systems, Inc. is that they will almost certainly be [the first](#) to implement M17 as a native capability, available off the shelf, ready to run M17.

In **Zero Retries 0133** - Connect Systems CS800D PLUS - Next Generation, the primary discussion was about the development of the (mobile) CS800D PLUS radio. The article emphasized the tight relationship that Jerry Wanger KK6LFS has developed with an Original Equipment Manufacturer (OEM) in China. That tight relationship was key in being able to develop the unique feature set of the CS800D PLUS.

At the end of the article, I said:

Editor's Postscript - After I received the original email, I talked briefly with KK6LFS and suggested that adding M17 as a "native" mode of the CS800D PLUS would be a unique selling point as the first Amateur Radio that supports M17 out of the box. KK6LFS agreed that the CS800D PLUS was likely (ultimately) capable of doing so, but there are a number of issues to be addressed before M17 could be implemented.

In a followup exchange of emails, I provided KK6LFS with some pointers to the M17 Project and pointers to the work that [OpenRTX](#) had done in adapting some portable radios to operate M17. As we ended the exchange, KK6LFS seemed somewhat interested in M17, but was non-committal.

At least, non-committal until this comment on Zero Retries 0145:

Hi Steve,

We will soon have a two commercial radios with M17. We currently are calling them CS7000 M17 and CS7000 M17 PLUS. I will probably generate a blog about the radios in the near future and you are welcome to reproduce it in its entirety or part of it. You can go to www.csi-radios.com to look what is put on the website.

It is being implemented by one of the key developers of the M17 project. It is being financed by Connect Systems Inc.

Best Regards,

Jerry

CSI's Primer on M17 and its New M17 Radios

This was posted to the Connect Systems, Inc. mailing list by Jerry Wanger KK6LFS to discuss the "bigger picture" of implementing M17.

What should you know about M17?

The M17 is a radio technology developed using open source hardware, software, and offer a complete digital radio protocol for data and voice, made by and for amateur radio operators.

The protocol's voice mode uses the free and open Codec 2 voice encoder. This means there are no patents, no royalties, and no licensing or legal barriers to scratch-building your own radio or modifying one you already own.

This freedom to build, understand and innovate is core to amateur radio, but has been missing from the commercially available digital voice modes. This is part of why amateur radio digital voice modes have largely stagnated since the 1990s and we're almost wholly dependent on commercial products that aren't well designed for amateur radio users.

M17 is about unlocking the capabilities that amateur radio hardware should already have.

Here you will find people working on radio hardware designs that can be copied and built by anyone, software that anyone has the freedom to modify and share to suite their own needs, and other open systems that respect your freedom to tinker.

(Taken almost verbatim from <https://m17project.org/>)

What is unique about the CS7000 M17 radio?

This radio will be both DMR compatible and M17 compatible. By having a radio M17 compatible, you now open up the possibilities of quickly flashing other protocols into the radio such as Fusion, DSTAR, NXDN and others.

With other radios, to completely reflash the radio requires you to take apart the radio, short two pins and then turn on the radio to get into a special downloading mode. With this radio you press the top button and turn on the power to get into the special downloading mode.

What is unique about the CS7000 M17 PLUS radio?

Besides all the features of the basic CS7000 M17 radio, this radio will double the amount of code memory, about three times the amount of internal ram memory and run about three times faster.

This will allow the HAM community to advance the state of the art in communication technology and have the first true multi-protocol digital radio.

Connect Systems M17 Radios

We are developing two radios based on an existing radio from our manufacturer. This M17 radio is going to be a modified CS760. To be true to the M17 project, schematics and a parts list will be provided so you can make your own. However, as part of the design, for the CS7000 M17 we will allow you to load at will either the M17 firmware or the DMR software.

If you wanted to make your own radio, the DMR software will require you to spend a few hundred thousand dollars for the AMBE II vocoder firmware, the radio and battery tooling will cost about \$80,000 and you will need to find someone to build it for you. The parts are so small in the radio, you need to either go to someone who has the capability to build the radio or solder it yourself under a microscope. Using three-dimensional printing technology, it is possible to build the case and battery holder yourself for a nominal cost thereby saving the \$80,000 in tooling cost.

Why buy CS7000 M17 when you can get a cheaper M17 radio?

There are some inexpensive Chinese radios you can modify to do the M17 protocol. If you have the tools and ability to work with small SMD parts you can save a little. With the CS7000 M17 we do it all for you and it is plug and play.

The CS7000 M17 is a much better radio than the cheap Chinese radios. This radio is Part 90 certified, manufactured to commercial standards and has a frequency range of 400-512 MHz. The other radios are typically 400-470 MHz and designed to amateur standards. Many of those radios are not Part 90 certified.

Why should you get the CS7000 M17 PLUS?

The CS7000 M17 PLUS was designed to have multiple protocols in a single radio. The CS7000 M17 can only have a single protocol at a time. The DMR protocol takes between 500,000 and 1,000,000 bytes of code depending on the features you have. The M17 protocol takes about 400,000 bytes of code. There is a lot of overlap between the code that the DMR protocol takes and the M17 takes so in theory the combined will take a lot less than the sum of the two.

The DMR or M17 protocol takes most of the available resources of the computer running at 168,000,000 instructions per second. The CS7000 M17 PLUS microprocessor will run at three times the speed thereby allowing you to develop better algorithms and have more features than you can have with the basic radio.

What can a more powerful M17 radio do?

We can change the modulation from 4FSK to 16FSK. That will allow us to reduce the bandwidth in half. We can change the vocoder to work at half the data rate. This will again reduce the bandwidth by two. With these two features we can have four channels in a bandwidth of 6.25 KHz. If we use the bandwidth of the old analog channel, we can have 16 channels of voice compared to the single channel of voice that we used to have. If we use it for data, we could double the transmission speed.

We can put in an AGC for the voice so the voice level will sound the same no matter how softly the other person is speaking.

I am sure the amateur community will develop other features that will advance the state of the art compared to commercial radios.

What is Connect Systems Role in this project?

We are doing two things. We are paying to have one of the key designers of the original M17 radio implement what was done before in the cheap Chinese radios in the CS7000 M17 and CS7000 M17 PLUS.

We are coordinating and paying the manufacturer of the radio to make the necessary changes to make the CS7000 M17 and CS7000 M17 PLUS radios.

Status of CS7000 M17 Project

1. Have manufacturer send sample radios to engineer to modify and test.
Completed
2. Have engineer pay import duties and receive radio.
Completed
3. Determine changes necessary to put in radio.
Completed
4. Put changes in radio and test to verify changes work.
Pending
5. Modify software from working M17 radio to be compatible with CS7000 M17 radio.
Pending
6. Improve performance of radio.
Pending
7. Release radio for limited beta testing.
Pending
8. Ship to new radios to customers who prepaid.
Pending

Supporting This Project

We are asking the amateur community to buy in advance one or more of the radios. When the radios are available, you will be the first to get them at a discount from the standard price of the radio. If at anytime you decide you would rather not support this project, you can get your money back and then get in the back of the line for when the radios are released.

[CS7000 M17 UHF Radio - Details](#)



Image courtesy of Connect Systems, Inc.

The CS7000 M17 is the first Amateur digital radio designed for the M17 protocol. The user make the radio into either a M17 radio or a standard DMR and Analog radio.

There are a few things that make this radio different than the standard DMR radio.

1. The ability to easily get in the native boot mode of the microprocessor to unbrick the radio without opening the radio. This is very important when developing new features because of chance in bricking the radio.
2. Hardware modifications from standard DMR radios to allow it be used with protocols other than DMR and Analog.
3. Optional GPS.

Although there is not enough memory in this version of the radio to support multiple protocols at the same time, this radio should be able to take the protocols developed for the plus version and be ported to this version of the radio.

Expanded information from the [Store page for the CS7000 M17](#):

This is a radio designed to do the M17 Protocol. For those not familiar with M17, it uses 4FSK modulation with an open source Protocol and Vocoder. This entire methodology was designed by the HAM community. At the current time, this radio is not finished. However, if you would like to buy it now, you will get a \$50 discount from the regular price and will ship in the sequence we get orders when the radio is finished. We are in effect setting up a "Crowd Funding" page. If at any time before the radio is shipped, you are welcome to cancel the order and you will get a complete refund of the amount you paid. We expect to ship in late May 2024.

This radio includes the following items:

- Radio
- Battery
- Antenna
- Power Supply
- Battery Charger
- Strap
- Programming Cable

Due to limitations of the the hardware, this radio will only do M17. There is not enough memory in the radio to do more protocols. See CS7000-M17 PLUS for more features.

[CS7000 M17 PLUS UHF Radio](#) - Details



Image courtesy of Connect Systems, Inc.

The CS7000 M17 Plus is the first Amateur digital radio that has the ability to have multiple protocols in a single radio. The first version of this radio will have DMR, M17 and Analog protocols.

There are a few things that make this radio different than the standard DMR radio.

1. Double the program memory to two megabytes that will allow a single radio to have DMR, Analog, M17 and other protocols such as DSTAR, P25 and other protocols.
2. Triple the RAM memory to 1 megabyte that will allow the radio to overlay large programs that is unique to different protocols.
3. A processor that is three times faster than what is normally used in DMR radios to allow the ability to develop new algorithms to advance the state of the art of communications and allow the radio to work better than the commercial radios that are currently sold.
4. The ability to easily get in the native boot mode of the microprocessor to unbrick the radio without opening the radio. This is very important when developing new features because of chance in bricking the radio.
5. Hardware modifications from standard DMR radios to allow it be used with protocols other than DMR and Analog.

6. Built in GPS.
7. Built in BlueTooth
8. Built in Vibrator

Expanded information from the [Store page for the CS7000 M17 Plus](#):

This is a radio as initially shipped, is designed to do the DMR, Analog and M17 Protocol. For those not familiar with M17, it uses 4FSK modulation with an open source Protocol and Vocoder. This entire methodology was designed by the HAM community. At the current time, this radio is not finished. However, if you would like to buy it now, you will get a \$50 discount from the regular price and will ship in the sequence we get orders when the radio is finished. We are in effect setting up a "Crowd Funding" page. If at any time before the radio is shipped, you are welcome to cancel the order and you will get a complete refund of the amount you paid. We expect to ship in late August 2024.

This radio includes the following items:

- Radio
- Battery
- Bluetooth
- GPS
- Vibrator
- Antenna
- Power Supply
- Battery Charger
- Strap
- Programming Cable

This radio is in effect a super CS7000 M17 radio. Compared to the CS7000 M17, the radio is about three times faster, has twice the program memory and at least four times the flash memory used to hold contacts, channels and other parameters.

With this capability, the radio can easily do multiple protocols in the same radio.

(End of Connect Systems material.)

This is a really cool development! [M17](#) is really starting to gain some traction with this privately funded development of portable radios with native M17 capability.

Couple this with the infrastructure for using M17 such as repeaters:

- [M17 Project's Remote Radio Unit](#) (an impressive unit that can be installed as a repeater very close to an antenna), and
- Support for M17 as a standard mode of [Multi Mode Digital Voice Modem \(MMDVM\)](#) that can be [installed in an FM repeater](#) to make it "multi-mode".

Reasons to be Excited about CSI M17's Radios

One reason... perhaps a nitpick, but still important, is that with CSI's M17 radios, Amateur Radio finally has a "plug and play" ~~open source digital radio system~~ that it can promote to those who require a system to be open source before they have any interest or involvement.

***Update 2025-08-07** - A Zero Retries reader provided feedback that it's not entirely accurate to characterize CSI's M17 radios as "open source". They are one company's products that implement M17, but don't allow user changes of the software /firmware of the radio other than provided as updates from CSI. A more accurate characterization is below.*

One reason... perhaps a nitpick, but still important, is that with CSI's M17 radios, Amateur Radio finally has a "plug and play" M17 radio that it can promote to those who require a system to be based on open source before they have any interest or involvement.

For example, in DMR, D-Star, and System Fusion, they have been "turned off" by the presence of a proprietary CODEC in the middle of the radio that they had no capability to work around. Although a proprietary CODEC might still be present in these radios, it's use is optional (required if you want to use the radio for DMR) or bypassed when operating in M17 mode.

Note the excitement discussed in **Zero Retries 0145** about the Quansheng's UV-K5 - The Most Hackable Handheld Ham Radio Yet. From my reading, the UV-K5 is (somewhat) accidentally compatible with hacking... but the CSI CS7000 M17 Plus is truly *designed* for hacking:

- 2 MB flash (?) memory for storage
- 1 MB RAM
- Fast(er) processor
- Easy to recover from a bricking when experimenting with software.

- Built in GPS
- Built in BlueTooth

I was intrigued with KK6LFS's description of the potential uses of the CS7000 M17 PLUS' enhanced capabilities:

We can change the modulation from 4FSK to 16FSK. That will allow us to reduce the bandwidth in half. We can change the vocoder to work at half the data rate. This will again reduce the bandwidth by two. With these two features we can have four channels in a bandwidth of 6.25 KHz. If we use the bandwidth of the old analog channel, we can have 16 channels of voice compared to the single channel of voice that we used to have. If we use it for data, we could double the transmission speed.

One of the unrealized capabilities of current generation portable radios for Amateur Radio is data, especially once radios (especially portables) began to include Bluetooth. In theory, this was a great development for being able to do Amateur Radio data from one's laptop (or phone or tablet). But the reality quickly became apparent that either the protocols implemented in the radios have fallen short (the slow data of D-Star and the limitation of "photos *only*" in System Fusion are two examples) or the Bluetooth implementation has been incompatible, etc. With the existing protocols and the Bluetooth... we had no way to fix those once we knew what the issues were⁵.

That's no longer the case with the CS7000 M17 PLUS... having its capabilities defined almost entirely in software. Once we figure out something is wrong, we *can* fix it. And it will probably be just as easy to add new features and fix existing features now that the paradigm for doing so easily has been established with the "easily hackable" Quansheng UV-K5.

Some ideas of mine that the CS7000 M17 PLUS might be capable of:

- Variable Forward Error Correction (FEC) for voice depending on conditions. For example, the repeater could report back to the radio that it's at the limit of the current FEC for good voice quality and the radio needs to engage a more robust FEC to maintain good communications.
- Simultaneous voice and data similar to the way System Fusion can transmit all digital voice at high quality, some digital voice and some data, or all data at higher speed.
- Support two different modes such as M17 for voice and text, and MMDVM-TNC for higher speed data.

For those that are thinking "M17... just another digital voice mode..." when we already have digital voice modes such as DMR, D-Star, System Fusion, P25, etc., M17 is a new and unique capability in Amateur Radio because:

- M17 was developed *from within* Amateur Radio *for the unique needs* of Amateur Radio.
- M17 was created from the beginning using Open Source principles - there's no proprietary interest or encumbrances as there are with previous digital voice systems.
- M17 doesn't use / require the use of a proprietary CODEC chip such as all previous implementations of digital voice. M17 uses the open [Codec 2](#) CODEC.
- M17 isn't just a digital voice protocol; it's the entire ecosystem - digital voice, data, the protocol, Internet interoperability, reference hardware implementations, etc.

In short, M17, with its open source ethos, and now a reasonable range of entry points including reasonably priced "buy it and use it" radios such as the CS7000 M17, or even less expensive radios that can be modified for M17, bodes well for experimenters that want to experiment with open source technologies in Amateur Radio.

Kudos to Connect Systems for this development to move M17 forward into mainstream use!

Connect Systems and KK6LFS - Asking to Vote With Your Wallet

Connect Systems is committing its own funds on the speculation that there will be a market for these radios, and it's asking for a show of confidence for these radios by putting down deposits for radios delivered within 2024. I think that's a reasonable request and a more efficient way to crowdfund the development costs than using a third party like Kickstarter or GoFundMe.

I'm sufficiently intrigued that I'll be putting down a deposit on a CS7000 M17 or CS7000 M17 PLUS within the month. I hope I'll have lots of company to encourage continuing development of these new radios.

Leave a comment

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Detailed Plans for Immediate Future of APRS Foundation

By Steve Stroh N8GNJ

If this issue of Zero Retries weren't already overflowing (for a emailed newsletter), I would reprint this email from APRS Foundation in its entirety. But that's not possible in this issue, and this new information about APRS Foundation is timely, thus I'll defer to the original post for the detail of the help that APRS Foundation is requesting.

It's still puzzling to me that this type of fundamental information is available solely on ephemeral mailing lists instead of being prominently posted on APRSF's website... but one of the things they're asking for help is with the website, so maybe, eventually they'll do so.

Jeff Hochberg - W4JEW, APRS Foundation President, on the two APRS mailing lists:

[APRS Foundation Inc. - Opportunities: Great! Now What?](#)

The APRS Foundation intends to build a solid foundation for APRS to build upon - no pun intended. You have to admit...that was a little "punny." I couldn't resist! :-)

We can head in countless directions, but much cleanup must be done to establish a baseline.

A mix of technical and non-technical work needs to be done. Some won't be fun, but it's a necessity and will be rewarding! It's long and daunting, but please read through the opportunities to find a place where your skills can help.

- **Define Use Cases**
 - Opportunity - Start APRS Use Cases Thread
- **Rebranding**
 - Opportunities - Rebranding
- **Website**
 - Opportunities - Web Design & Content Review (Multiple opportunities)
- **Webmaster**
 - Opportunities - Webmaster (1 to 2 opportunities available)
- **Documentation**
 - Opportunities - Documentation Editor (4 to 6 positions available)
- **Project Management**
 - Opportunities - Project Manager (# based on demand)

Please email info@aprsfoundation.org if you are interested in helping manage the aforementioned projects and/or any future projects.

Volunteer Work - Not Employment

While APRS Foundation Inc. is a non-profit organization, please do not perceive these opportunities as an offer of employment. John, Lynn, John, Jason, and I are board members, but we do so on a voluntary basis and are not compensated in any way.

The work we are requesting assistance with is on a volunteer basis only.

Keep in mind that we are all working towards Ensuring the Future of APRS! There is no better way to give back to the global amateur radio community than through work of this nature! It's extremely important, and the rewards are that you get to say you worked on it!

A Lot To Do

As you can see, there's a lot to do. We're looking for a few good hams!!! We are just getting started! But we cannot do this without YOU!

To make this point abundantly clear, our door is open to any licensed amateur radio operator worldwide interested in contributing to the effort! If one of the areas above strikes a chord with you, please join the conversation and come along for the ride!

Please be patient—we may take a week or two to reply, but I assure you we will!

Thank you for taking the time to read this message. We look forward to working with you!

[Leave a comment](#)

[Share](#)

ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

[AMSAT-DL - The next generation of a GEO/MEO amateur radio payload?](#)

Here is the proposal for an AMSAT-DL [geostationary microwave amateur radio payload](#), written by the authors Kai Siebels DH0SK and Matthias Bopp DD1US. The proposal takes into account the technical requirements and needs of radio amateurs. Various aspects such as orbit, satellite and platform as well as payload are taken into account.

Among the possible orbits such as MEO, HEO and GEO, the GEO orbit has proven to be the most suitable due to the extensive experience with OSCAR-100. A good compromise for the orbit position would be at ~43 degrees West to also support Eastern European countries and most of North America.

A payload for amateur radio should allow the greatest possible scope for experiments on different bands. Six bands could be used for the uplink to enable experiments with different frequencies. The main uplink band is the 13 cm band, the main downlink band is the 3 cm band. All proposed band / NB transponder combinations can be implemented at the ground station with very reasonable effort.

A dedicated AMSAT (Amateur Radio) mission based on an ESA-supported Micro GEO provides opportunities for several additional experiments that support AMSAT's education, science and development goals to inspire young people with amateur radio technology. Finally, such a mission could also provide an excellent platform for disaster/emergency communications directly via the GEO satellite transponders.

The link in the first paragraph is a 31 page presentation (PDF) with an amazing amount of detail about potential options for another Amateur Radio geosynchronous satellite, which would include coverage for much of North America (Canada).

[Amateur Radio Television Repeaters Using an Optical \(Laser\) Link](#)

In Issue 158 of the Boulder Amateur Television Club TV Reporter's REPEATER newsletter, Editor Jim Andrews KH6HTV mentioned this Zero Retries Interesting information:

SAN DIEGO ATV NEWS: Mario, KD6ILO, has recently sent us several e-mail up-dates on their on-going project to use light transmitters in place of microwave transmitters to link up their several sites. I will try to summarize what they are doing here.

Mario reports that they are doing over the air tests of their new optical ATV link transmitter over a 3 mile path between a couple of the group's sites in southern California, San Diego area. The laser transmitter is operating on 1.55 μ m {1550nm}. They are using 600 mW of power. An EDFA laser light amplifier is used as a pre-amp for the optical receiver. Pointing their extremely narrow laser beam is tricky. They use a beacon beam to find its mark, acquiring and keep a lock once established to send test signal.

Their plans are that these will be used for back-bone links to replace their current RF links for optimum deployment and handling very high data traffic which RF can't. They are calling their system FSOC, short for Free Space Optical Communications. This project is costing their group \$120,000. EDFA amplifiers do not come cheap ! Sounds like they found some "deep pockets" somewhere!

Laser links?!?!?! Who *can't* get excited about laser links?

[FreeDATA Improvements in Progress](#)

David's FreeDV Update – March 2024

...

FreeDATA Update

Part of our ARDC grant activities is to support the FreeDATA project. Simon and team have recently completed a major re-write and FreeDATA is back on the air. This month I've been working with Simon on a faster modem waveform for "ACK" packets, that will help speed up the FreeDATA protocol. I'm also pleased to see FreeDATA working over real HF channels, including this [7 hour 1.44Mbyte file transfer](#) over an 800km path.

[Universal Radio Test Instrument \(URTI\) - Continued Progress](#)

Good progress report on this open source project by [Great Scott Gadgets](#) (of HackRF fame)...

to design a single hardware platform capable of serving as many popular types of one-port or two-port RF test instruments. We plan to build a directional coupler into a wideband, full-duplex SDR platform to enable URTI to function as a:

- Spectrum analyzer
- Vector network analyzer
- Vector signal generator
- Vector signal analyzer
- Antenna analyzer
- Power meter
- Frequency counter
- Full-duplex SDR transceiver

My thanks to [RTL-SDR.com for the pointer](#) to this progress report. This was another great Research & Development project [funded by a grant from ARDC](#).

I look forward to this unit becoming available!

[GNU Radio Conference 2024 Call for Participation](#)

GRCon24 will take place in Knoxville, TN from Sept 16-20

GRCon 2024 celebrates and showcases the substantial and remarkable progress of GNU Radio and its usage in a diverse field of applications and industries.

We invite developers and users from across the GNU Radio Community to present your projects, presentations, papers, posters, and problems at GNU Radio Conference 2024. Submit your talks, demos, and code!

Call for Participation Key Dates:

- March 1 - Open for Abstract Submissions
- June 17 - Abstract Submissions Close
- July 12 - (Initial) Main Track Schedule Posted

GNU Radio has a lot of crossover potential with Amateur Radio, and there are always several Amateur Radio related presentations during a GRCon.

What I learned when I replaced my cheap Pi 5 PC with a no-name Amazon mini desktop

Andrew Cunningham on ARS Technica:

Pi 5 is still an odd fit for day-to-day desktop use; cheap mini PCs come closer.

I recently [tried to use a Raspberry Pi 5 as a regular desktop PC](#). The experiment wasn't a failure—I was able to use a Pi to get most of my work done for a few days. But the device's performance, and especially the relative immaturity of the Linux's Arm software ecosystem, meant that there were lots of incompatibilities and rough edges.

One of the problems with trying to use a Pi 5 as a regular desktop computer is that, by the time you've paid for the 8GB version of the board, a decent active cooler and case, and (ideally) some kind of M.2 storage attachment and SSD, you've spent close to a couple of hundred dollars on the system. That's not a ton of money to spend on a desktop PC, but it *is* enough that the Pi no longer feels miraculously cheap, and there are actually other, more flexible competitors worth considering.

...

But if you're actually looking for a cheap functional everyday PC and not just a hobby project, these oddball no-name computers do give you a lot for your money. Arm software is on the rise, but in the here and now (and for the foreseeable future), there's simply no substitute for the app compatibility of an x86 processor, whether you're trying to run the same Linux distros you run on the Pi or you want to run Windows 10 or 11.

In my reading, I've seen a number of folks come to the same conclusion. If you're looking for a reasonable, but cheap “desktop” experience, then the mini PCs with Intel processors are probably a better value versus a fully fleshed out a Raspberry Pi 5 board with fan, solid state drive, etc. Many of them can also be run directly on 12 volts. The article explains how to pick mini PCs with *current* Intel processors that provide reasonable performance despite the low price.

I remain a fan of Raspberry Pi computers for the ability to create dedicated appliances for various tasks with the RPi as a compute core, but with the RPi5's requirement of a fan... (versus a fan being optional, with a decent heatsink on the RPi4) is problematic. It may be that the RPi5's real potential will only be realized in follow-on products such as a “Raspberry Pi 500” or a Raspberry Pi 5 compute module.

TACNPR - Another Independent Implementation of New Packet Radio

On Mastodon, I [received this note](#) from Mastodon user “ftg”:

...

In NPR-70 news.

There is also TACNPR from Finland, which is a firmware compatible reimplement of the NPR-70 radio.

<https://github.com/partio-scout/scoms-tacnpr>

12-28V input, 10-15W RF (20 Watt Transmit Power)

On that site, there is both the CAD view (mockup) of the board, and what certainly looks like a completed board (at least the top side - the power amplifier brick is probably mounted on the bottom of the board).

I had not previously heard of this project, and doing a brief web search, found this informative slide deck - [SCOMS TACNPR project](#) which provides background on this project:

- We wanted more integrated hardware than the original (+integrated PA)
- Finnish Scouts organization was seeking a reliable telemetry solution for a big
- scout camp
- Scoms* team (Scout Monitoring System) had some ideas and synergy with their earlier projects
- Personally, I wanted to learn KiCAD (switched from EAGLE)

Technical guidelines

- **Must:** Binary compatibility with the original design (exactly the same CPU)

- W5500 (SPI ethernet) and RJ45 jack integrated
 - This decision was changed later on: module, to save space on board
- RF PA would be Motorola MHW720A hybrid (20W out)
 - Well-known from RD5* Mobiras
- PSU: Buck converter design from an earlier Scoms project
 - 2 converters in parallel to generate enough amps at 12V, third one to step down 12→3V8 for logic
- KiCAD will be used, prototypes using JLCPCB PCBA (assembly) service
- Targetting 100mm x 100mm board size
- SRAM option included, but no support for FDD mode
- SMD LEDs where they happen to be
- Same license as the original work (TAPR OHL)

The big benefit of this unit is that they chose a power amplifier module capable of 20 watts! That power level will help out a lot on a transmission with a 1 MHz channel size.

This is a cool project, but in a web search I wasn't able to find any more details such as if these units were ever put into use or built up other than as a prototype. The last update on the Github page was in mid-2023. I hope this project has continued!

If you want to get going on New Packet Radio in 2024 (100 kbps - 1 Mbps, 420-450 MHz, 7 watts, native TCP/IP with an Ethernet interface), I recommend the [New Packet Radio Modem Version 2, NPR-H 2.0](#). It's assembled and tested (need to add an enclosure), and available immediately.

A Smattering of Amateur Radio Technology Societies

A delightful discovery from the above was [Radio Amateur Technology Society in Finland – RATS / OH2NXX](#)

Which prompted me to do a “quick” web search which led to:

- [Allen County Amateur Radio Technical Society \(ACARTS\)](#) in Fort Wayne, Indiana, USA.
- [Ashland Amateur Radio Technical Society \(AARTS\)](#) in Ashland, Indiana, USA.
- [Chicagoland Amateur Technical Society \(CATS\)](#) in Chicago, Illinois, USA.
- [Kempton Park Amateur Radio Technical Society \(KARTS\)](#) in Kempton Park, Gauteng, South Africa.
- [Minnesota Amateur Radio Technical Society \(MN-ARTS\)](#) in Minnetonka, Minnesota, USA (previously mentioned in Zero Retries).
- [Richmond Amateur Telecommunications Society \(RATS\)](#) in Richmond, Virginia, USA.

Sadly, [Amateur Radio Technical Society \(ARTS\)](#) in Des Moines, Iowa, USA and the storied [Radio Amateur Telecommunications Society \(RATS\)](#) in Northern New Jersey, USA seem to have died more than a decade ago judging by their websites being offline and the lack of updates to ARRL.

[The Wi-Fi Only Works When it's Raining](#)

Finally, this is an amusing, claimed-to-be-true story (despite being published on 2024-04-01) that illustrates nicely the line-of-sight issues with outdoor, long distance microwave communications.

Leave a comment

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Update

Followup / additions / corrections on stories in recent issues of Zero Retries.

More on IPv6 in Amateur Radio - Previous Discussions

I've discussed the potential use of IPv6 in Amateur Radio several times previously in Zero Retries, most extensively in **Zero Retries 0127** - More Thoughts on IPv6 - No “44Net” within IPv6. Apparently I'm late to the exploration of this topic - my bad for not doing a web search prior to writing that article. There's some significant previous work:

- An extensive paper by Bryan Fields W9CR in 2016 - [IPv6 in Amateur Radio](#).
- Another extensive paper by Daniel Estévez EA4GPZ / M0HXM in 2019 - [IPv6 for Amateur Radio](#).
- A blog post by Daniel Srebnick K2IE in 2021 - [The Importance of IPv6 in Amateur Radio](#).

- A blog post by Matti Aarnio OH2MQK (undated) - [Some idea for IPv6 addressing for radio-amateur nodes](#).
-

More Details on Quansheng UV-K5 Hacking

Re: **Zero Retries 0145** - The Most Hackable Handheld Ham Radio Yet

Mastodon user “ftg” contributed this:

Amusingly that IEEE article is over 6 months out of date about the current state of UV-K5 hacking.

We have had FOSS firmware for over half a year now.

DualTachyon developed a FOSS firmware under Apache 2.0 for the UV-K5 with 1:1 feature parity with the factory firmware.

<https://github.com/DualTachyon/uv-k5-firmware>

And others than took off from there.

Best central location for UV-K5 info is the wiki maintained by Ludwich

<https://github.com/ludwich66/Quansheng>

Correction 2024-04-06 - correct URL follows:

https://github.com/ludwich66/Quansheng_UV-K5_Wiki/wiki

Thus there is a bunch of open (fagci's spectrum, Matoz MCFW, egzumer and oneofeleven for example)

and closed (IJV, uvk5cec by phdlee)

One really exiting recent development is Phil McAllen's hardware reverse engineering and documentation project nearing it's end.

It can get very interesting when people start creating drop-in PCB's with new CPU's and new RF frontends for the UV-K5 later.

The output should be a proper Kicad 7 project.

Leave a comment

Share

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out

Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything*!
- **Founding Members who generously support Zero Retries financially:**
 - Founding Member 0000 - Steven Davidson K3FZT
 - Founding Member 0001 - Prefers to Remain Anonymous 01
 - Founding Member 0002 - Chris Osburn KD7DVD
 - Founding Member 0003 - Don Rotolo N2IRZ
 - Founding Member 0004 - William Arcand W1WRA
 - Founding Member 0005 - Ben Kuhn KU0HN
 - Founding Member 0006 - Todd Willey KQ4FID
 - Founding Member 0007 - Merik Karman VK2MKZ
 - Founding Member 0008 - Prefers to Remain Anonymous 14
 - Founding Member 0009 - Prefers to Remain Anonymous 19
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and

include a link:

<https://www.zeroretires.org>

- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR: Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

Zero Retries is currently using the [Substack email publishing platform](#) to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join **1400+** other subscribers:

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Social Media:

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Zero Retries (N8GNJ) is also on Bluesky — [@n8gnj](#) — just click:

[Zero Retries / N8GNJ on Bluesky](#)

Email issues of Zero Retries are "instrumented" by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2024-04-05

Blanket permission is granted for TAPR to use any Steve Stroh content in Zero Retries for the TAPR Packet Status Register (PSR) newsletter (I

owe them from way back).

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[1](#)

Technological innovation, the technical aspects of Amateur Radio, and Amateur Radio...

[2](#)

None of these books contributed to DLARC were published by ARRL. I've contributed ARRL books to DLARC, many that are long out of print (and not available from ARRL as print on demand, or digital versions), but they don't appear in DLARC. When I asked about them, I was told "ARRL has asked us to take them down, and we complied." I can understand this position regarding titles still available for purchase (including digitally or via print on demand). But absent that case, I *really* wish ARRL could *understand the role of a publisher in the 21st century*.

[3](#)

Full disclosure - I was on the ARDC Grants Advisory Committee at the time of this grant, and I enthusiastically voted for that grant.

[4](#)

The CSI radios aren't shipping yet, and thus it's conceivable (but unlikely...) that another manufacturer will ship a radio with native M17 support in the interval between CSI's announcement and the radios actually shipping. But CSI has a good reputation and many satisfied customers.

[5](#)

Yes, current generation radios can be updated via a firmware update, but such updates seem to be very rare, and current commercial vendors are loathe to provide updates that add features, especially when they cannot get additional revenue for such added features.